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Constraints and Opportunities for Sustainable Livelihoods and Cash Income Generation from NTFPs in the Mountains of Northern Parts of Pakistan

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Abstract: Pakistan's forest resource base is mostly found in the mountains of the North-West Frontier Province (NWFP) supporting the livelihood of the rural poor and providing different ecological services. The present study was, therefore, initiated with the aim to evaluate different constraints and opportunities for sustainable livelihoods and cash income generation from NTFPs in the mountainous area of NWFP, Pakistan during 2008. Information was collected through questionnaire and interviews during field trips. A total of 117 NTFPs species have been recorded which are being used locally for various purposes such as fuel wood, fodder, medicinal plants, vegetables, mushroom, agricultural tools making, furniture, thatching, shade, fencing/poles, ornamental purpose and animal products. The majority of plants are multi-functional like *Pinus wallichiana* provides timber, firewood, torch wood, the leaves/small branches are used as thatch for roofing, split logs are used for fencing and the decomposed needles are collected as humus for agricultural fields. These products were widely used by the indigenous community supporting their livelihood. The study proposes protection and sustainable management of these valuable resources for rural livelihoods, which might be useful for developing regional strategies of sustainable management of forest resources.

Key words: Livelihood; Forest resources; Communities; Management; Unsustainable use; Opportunity

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1 Introduction

Forest resources in the study area represent unique and enormous diversity of flora and fauna mostly growing in fragile ecosystems that are predominantly inhabited by rural poor and indigenous communities. Among the forest resources, Non Timber Forest Products (NTFPs) play a significant role in the subsistence economy of the people, especially those living in the rugged and impoverished hills, mountains and rural interiors. The collection, simple processing and trading of NTFPs contribute significantly to the cash income of the poor and women in mountainous area (Sher *et al.*, 2004a). A large variety of these products like medicinal plants, morel mushroom, fuel/timber wood, fodder and some animal products etc is accessible to forest dwellers, the exploitation is mostly capital extensive and have enormous economic potential. Due to the often-low commercial value of unprocessed forest products, it has proved necessary to search ways and means to add value to the products, which could enable the forest inhabitants to better commercialize their products and more efficiently transform their natural capital into financial capital. (Agrawal and Gibson, 1999; Hussain *et al.*, 2004). In the last two decades forestry issues have been associated with wider

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socio-economic and environmental concerns, such as biodiversity loss, climate change, poverty and governance (Angelsen and Wunder, 2003; Sher *et al.*, 2005). In particular, foresters and tenure specialists have underlined the necessity of understanding people's rights in land and the incentive structure for land use in the quest for effective natural resource management. These recent perspectives in natural resource analysis emphasize the relevance of understanding the nature, adequacy of local people's resource rights, the livelihood opportunities and the existing management systems to ensure the sustainable use of the resource base. The indigenous forest dwellers have been reported as best forest managers due to their intimate knowledge of forest environment, their cultural dependence on its resources and many generations of harmonious co-existence with the ecosystem. (Poffenberger, 2002; Wolverkamp, 2000; Sher *et al.*, 2005; Focho *et al.*, 2009). These approaches link the maintenance of livelihoods and development of forest dwelling people to forest resource management and conservation. The sustainable management of these traditionally used NTFPs not only help conserve nationally and globally important biodiversity but also provide critical resources to sustain livelihoods. However, unsustainable and large scale harvesting of NTFPs from their natural habitats without providing equitable benefit to the local people and government is of grave concern.

The study area lie in the Hindu Kush Mountains, located in the northern part of Pakistan, and ranges in elevation from 1200 to 3660 m. The area is not climatically uniform. Altitude and exposure has greatly modified climatic conditions within the area. On the basis of altitude, climate and vegetation, the area can be divided into Moist Temperate Forest; Sub-Alpine Forest; and Alpine glimpses. The lower slopes of the area are extensively farmed while forest, especially of conifers, becomes prominent at higher altitudes (Fig. 1). Forest in the area is the property of a number of private landowners with the Provincial Forest Department of NWFP having some responsibility for management. Revenue from timber sales is split between owners and the Forest Department. No doubt the available forest in the study area has the potential of providing a sustainable source for many goods and services in the form of NTFPs yet are suffering from degradation, mainly due to timber harvesting and overgrazing by domestic livestock. It is estimated that the volume of illegal harvest exceeds that of the legal harvest (reaching to 2.6 million cubic feet in 2007). The study area, district Swat, is considered to be a prime site for Hindu Kush-Himalayan NTFPs, especially of medicinal plants found in Pakistan having forest their main habitat. There have been no regulations for protection of NTFPs,

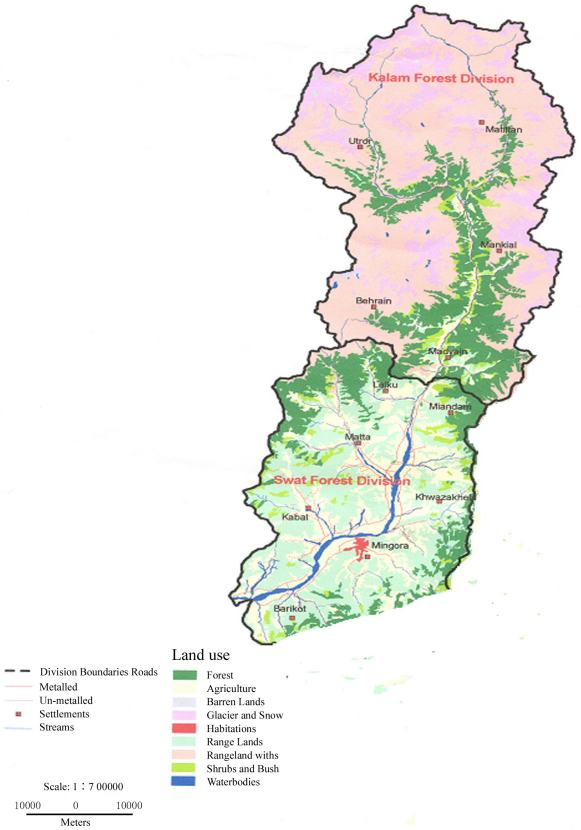

Fig. 1 Land use map of the study area (Source: GIS Lab, Forest Management Centre (FMC) Peshawar Pakistan)

some of these have become scarce primarily due to commercial over-harvesting coupled with high grazing pressure. The present study was, therefore, initiated with the aim to assess different constraints and opportunities for sustainable livelihoods and cash income generation from NTFPs in the mountainous area of the investigation. This could be useful in developing regional strategies for sustainable management of forest resources.

2 Materials and Methods

A combination of quantitative and qualitative research methods was used in various parts of the study. Qualitative data were particularly useful in understanding people's perspectives, attitudes, beliefs and processes for interpreting quantitative data. The concepts of validity and reliability were applied for integration of qualitative and quantitative techniques. The fieldwork was conducted during spring and summer 2008 overs a period of seven months.

Prior to a visit to the research sites, a questionnaire was designed and pre-tested to find out if it actually worked. The questionnaire was tried out on a small group of 5 people in a randomly selected village outside the sampling frame of research sites. In the week following the pre-testing, amendments were incorporated in the questionnaire. Participatory techniques were used to collect information. The main techniques and tools for data collection included household surveys, key informant interviews and focus group discussions (FGDs). Questionnaire was administered to solicit information on socio-economic conditions and forest resource utilization with respect to their conservation and development aspects. A total 155 households were interviewed during the household survey. FGDs on specific issues were conducted with elder knowledgeable people to understand the mechanism of natural resource distribution and benefit sharing with minority groups.

The data were coded and then analyzed by using descriptive statistics analysis techniques. The coding involved structuring the responses available from the questionnaire and assigning them nominal values for analytical purposes.

3 Results and Discussion

Millions of people throughout the world make extensive use of NTFPs both for subsistence and cash, either on a regular basis or as a fall back during times of need, and constitute a safety net function to rural households. The study revealed people dependence on NTFPs, different categories of NTFPs, its extraction method and impact of extraction, contribution of NTFPs to the household economy and determined safety net role of NTFPs.

The study showed that forest dwellers used a wide range of NTFPs, categorized as fuel wood (7) food (23), medication (70) and construction including roofing (7). Other purposes included income generation such as sale of mushrooms (not used for subsistence) and medicinal plants; tool and furniture; games and handicrafts, and shade etc. Majority of plants is multi-functional and, therefore, very valuable to forest dwellers. For instance, blue pine (*Pinus wallichiana*) provides timber, firewood, use torch wood, and leaves/small branches use thatch for roofing, split logs for fencing and decomposed needles (collected from forest floor) as humus for agricultural fields (Table 1). The study revealed that the local people get benefits in the form of cultivated fruit trees, tool making materials, food and medicine, contributing to human capital, health and labour strengths. Moreover, in agro-pastoral economy, contribution to livestock and crop production systems in the form of fodder and leaf litter respectively is worth mentioning. The households involved in NTFPs extraction derive mainly subsistence and cash income, achieving food security and even trading in NTFPs products.

3.1 Firewood and Fodder Collection

The study showed that about 76 percent of the households in the investigated areas use fuel wood for domestic purposes. The majority of households (93.4%) were found to collect firewood from communal coniferous forest, while 6.6% households purchasing it from the market. Blue pine is the dominant species used by

Table 1 Lists of important NTFPs and subsistence timber utilization by households in the research sites

Product	Unit	Average annual quantity collected and proportion of household involved						Importance	
		Mingora		Khwazakhela		Kalam		Cash	Subsistence
		Mean	%	Mean	%	Mean	%		
Timber									
Houses	cft	600	100	650	100	30	100	−	++
Fencing	cft	0	0	0	0	300	83	−	++
Bed making	Pole	2.5	100	2	100	3	100	−	++
NTFPs									
Firewood	HL	579	100	580	100	316	100	−	++
Torchwood	HL	13	100	20	97	7	100	−	++
Wild vegetables	kg	27	91	40	100	8	76	+	++
Medicinal plants									
-Mushrooms	g	242	75	246	67	53	19	++	−
-*Shengo*	kg	18	8	40	19	0	0	++	+
-*Menial*	kg	14	8	47	19	0	0	++	+
-*Mushkbala*	kg	25	8	57	19	0	0	++	+
-Others	Occasional use							−	++
Fodder									
-Oak leaves	HL	465	95	534	94	241	89	−	++
-Pasture rent	Rs.	0	0	0	0	200	100	+	−
Forest humus	Bags	0	0	0	0	94	93	−	++
Animal products									
-Bear cubs	Opportunistic collection by households but mainly collected by hunters							++	−
-Furs/skins								++	−
-Musk								++	−
-Bush meat								−	+
Fruit									
-Walnut	kg	37	55	32	37	108	78	++	++
-Others	A wide variety of wild fruits used for subsistence							−	++
Thatching material	HL	6	97	7	100	3	98	−	++
Walnut bark (*dandsa*) and birch bark	Illegally collected by professional smugglers. Not reported by households							++	+

Key: −: No importance; +: Less importance; ++: High importance; HL: Head load (40−45 kg for men and 30−35 kg for women); cft: mean cubic feet; Rs: Pakistani Rupees; Bags: a sac of 2−5 kg. Annual consumption of timber used for household construction is based on an average house life of 60 years and timber extracted from a big tree is 600 cft in form of logs and 450 cft in form of scants. Weight of Mushroom, wild vegetables and walnut was calculated when dry

82% of households and was due to easy availability in near by village, easy splitting and no restriction in using. Oak (*Quercus incana*) was seen to be used by 12 percent of households and where as only 8% of households were found to use cedar (*Cedrus deodara*). On average all households were shown to have been using one women head load (approx. 30−35 kg) of firewood per day in summer for cooking and two men head loads (each man head load is approximately 40−45 kg) per day in winter for both cooking and heating. The average number of trees removed by each household per year for fuel wood was 5. The majority of the households (88%) removal green trees for fuel wood and only 12 percent of the households used dry trees for winter fuel wood. The consumption of fuel wood by households is higher in mountains than plain due to the harsh winter season and lack of means to afford the alternative energy sources due to prevailing poverty. Similar results were also documented by Haenusler *et al*. (2000) and Chang *et al*. (2000). They reported that fire wood consumption is usually higher in rural areas compare to the urban sites. The average time required to collect one head load of firewood was 2.5 hours. Majority of the households (94%) were of the view that the time required for fire

wood collection has doubled in the last ten years. The increase in time for collection of firewood appeared to be due to depletion of forest surrounding the villages. Similar results were also observed by Gunasena (1994) and Khan (1994). Both of them reported that the forests near residential areas usually remain under greater biotic pressure compared to remote forests.

The study revealed that the forest contributed a major portion of livestock feed as the fodder production from farm land was not sufficient enough to meet the feed requirement for the livestock. During rest of the period of the year, livestock graze freely supplemented by oak leaves. The use of oak leaves for fodder use was higher as compared to other species. The average oak fodder utilization was 534 female head loads per household per year.

3.2 Edible Food products

The study indicated that the households used 25 different plant species as vegetables. About 89.7% of the households were shown to use wild vegetables to supplement the existing food. The wild vegetables are collected in summer both for fresh consumption and as food reserve for winter. The average consumption of wild dried vegetables was 23 kg per household per year. Similarly, nine different wild fruit plants viz: *Berberis lycum*, *Diospyros lotus*, *Ficus indica Juglans regia*, *Monothica buxifolia*, *Morus alba*, *Punica granatum*, *Prunus padus* and *Viburnum nervosum* were used as wild fruit plants. The sale of fruits and nuts was very limited, except walnut (*Juglans regia*). Fifty nine percent (59%) of households had walnut trees on their private owned land. The average number of walnut trees per household was five with an average production of 115 kg per tree/year. The major portion of walnut production was used for sale or bartered where as only a small quantity kept use for the households consumption.

3.3 Medicinal plants

The study indicated that about 10 medicinal plants are locally used in traditional system of medicines for curing various health disorders. Some plants species are considered for the treatment of only one specific disease while other have multiple such uses (Table 2). The study revealed that older men and women have a rich knowledge of location and uses of medicinal plants for curing different diseases. The most widely traded medicinal plant species are morels locally known as *guchi* (*Morchella esculenta*) (Fig. 2). Morels are exported to international markets and also used by local traditional healers (*hakims*) for medicinal purposes only. About 50 tons of dried morels are traded each year by about 50 000 forest dwellers, mainly children and women. The local people had the knowledge about the association of mushrooms with different plant species where they can easily find them. Similar results were also reported by Sher *et al.* (2004a) who pointed out that the people in mountains have access to diverse medicinal plant species but are totally unaware of profitability, trade and future prospects of medicinal plants. The local people lose much of their profit from medicinal plants, especially mushroom, due to crude collection processing methods and in the sale exploitation by middlemen in their sale procedure.

Fig. 2　Morel mushroom

Table 2 Medicinal Plants uses in traditional system of medicine

Family name	Botanical name	Local name	Diseases treated recipe preparation
Aliaceae	*Allium sativum*	Ouga	Ground bulb mixed with brown Sugar and is taken with glass of water for the treatment of high Blood pressure
Araceae	*Arisaema jacuemontii*	Marjarrai	Dry rhizome is boiled in water and is given for the curing of throat infections and cough
Asteraceae	*Artimisia brevifolia*	Tarkha	Powdered leaves and floral parts are taken with water for the removal of intestinal worm. .
Asteraceae	*Cichorum intybus*	Han	Extract of the root is used for the curing of jaundice.
Berberidaceae	*Berberis lyceum*	Kwaray	Powdered root bark is taken with water for the curing of all diseases.
Brassicaseae	*Lipidium sativum*	Halam	A decoction of mature seeds is used for the curing of stomachic.
Fagaceae	*Quercus dilatata*	Banj	A decoction of fruits is used for the treatment of urinary tract infection.
Fumariaceae	*Fumaria indica*	Paprra	Extract of the whole plant is used for the curing of jaundice.
Geraniaceae	*Geranium wallichianum*	Srazela	Extract of the root is used to promote lactation in women.
Hypericaceae	*Hypericum perforatum*	Shin Chay	Dried flowers are taken with glass of water for the curing of depression and epilepsy.

3.4 Animal products

Over 40 bird species, including the globally threatened western tragopan (*Tragopan melanocephalus*) and many rare and threatened mammal species of the Western Himalaya are found in the study area. Hunters are keen to find the animals like musk deer (*Moschus crysogaster*), markhor (*Capri falconeri*), ibex (*Capra ibex*) and some bird species like pheasants are used for meat, trophies, skins and musk gland extraction from musk deer.

3.5 Tools Making and other useful NTFPs

Specific plant species like oak were used by households for making agricultural implements like handles for different implements, yokes, ploughs etc. The poles of blue pine (*Pinus wallichiana*) were commonly used for traditional bed making and furniture purposes by all households. Similarly, torchwood is the resinous wood which is extracted from core of blue pine tree and was used for lighting and helping in the burning of fuel wood. The majority of households (99%) was found to use torchwood. The average consumption of torchwood per household per year was 20 male head loads in the study area. Needles of conifers and small shrubs like *Plectranthus rogosus* are used by all households as thatching material for roof making. Overall 38 head loads were found to have used for construction of a two bed room house. The average annual consumption was five head loads per household for the repair of existing houses. Humus, a mixture of leaves, branches and soil is found on forest floor. The results revealed that 93 percent of households used an average of 94 bags of humus per year for manuring of agricultural fields either directly or indirectly after using it as litter for cattle. Moreover, dried root bark of wild walnut called *dandasa* is frequently used for cleaning teeth, particularly by women, as it imparts a pinkish colour to lips. Other uses of NTFPs included utilization of some plant species for brooms, teeth cleaning, honey production, fish poisons, rope making etc which were occasional and difficult to measure at the household level in the present investigation.

3.6 Contribution of the NTFPs to subsistence and cash income

The study showed that NTFPs contribute to 25.6 percent of household gross income per year (Fig. 3). The contribution of the NTFPs to subsistence income is highest (44.3%) among all sources of income with least contribution (7.4%) to household cash income. The NTFPs contribution to subsistence income increase substantially by including livestock graze and browse, medicinal uses and other minor and occasional uses of plant species for making brooms,

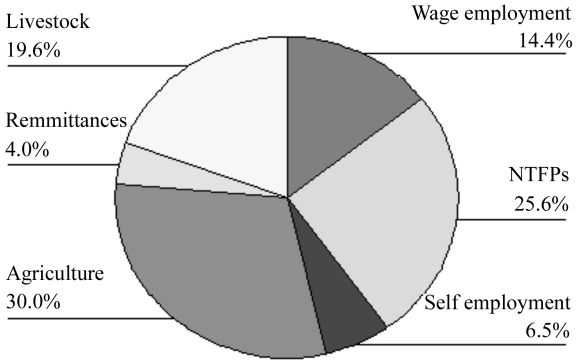

Fig. 3　Contribution of different livelihood sources to average gross income per household per year

teeth cleaning, medicines, rope making and fish poisons etc. Considering of contribution of each NTFP to gross NTFPs income (Fig. 3, 4), fuel wood has the highest contribution (50%), followed by fodder (26.1%) and wild fruits (7.7%). The overall dependence of the poor households on NTFPs for cash income generation was slightly more than the richer households. The poor households were involved in more labour intensive and low return activities like medicinal plants extraction where as the rich households generate much of their cash income from profitable activities like sale of walnuts. The income from mushroom appeared to have been low in the lowest quartiles as compared to others. The reason for this appeared the availability of less number of family members in households to collect wild mushrooms. The study also indicated that distance from market has a negative correlation with both cash and subsistence income from NTFPs, although the relationship between distance from market and cash income is non-significant compared to the highly significant relationship between distance from market and subsistence income from NTFPs (Table 3). This shows that the villages near to a market are less dependent on NTFPs for subsistence as compared to remote villages, possibly due to allocation of more time to agriculture activities, low ratio of migration in summer to pastures and the availability of alternatives. The present study is in line with the findings of Angelsen and Wunder (2003); De Zoyza and Inoue (2008). They observed that the NTFPs, having a medium or low return to labour, low capital or skill requirement and open or semi-open access, favours the economy of poor people who have no access to markets. The contribution of NTFPs to cash income increases greatly with the distance from the market. The reason may be that with the increase in income from other profitable activities like cash crop growing, wage employment and self-employment and the dependence on labour intensive activities like mushroom and medicinal plants collection decreases.

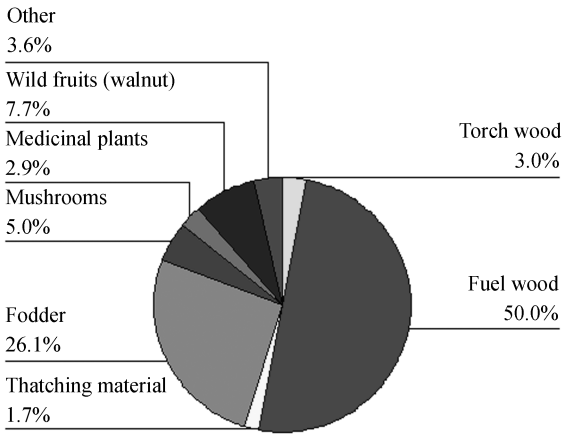

Fig. 4　Contribution of different components of NTFPs to gross NTFPs income

The result (Table 4) also shows that the overall dependence on NTFPs for subsistence use is slightly higher in richer households as compared to poor households. The richer households tend to use a slightly higher quantity of firewood, fodder, leaf litter and wild fruits as compared to poorer households. There is no significant relationship between the total income of households and NTFPs use for both cash and subsistence income, but the total cash income of household shows a non-significant negative relationship with subsistence income from NTFPs use. The total expenditure of the household shows a positive relationship with NTFPs use,

Table 3 Average contribution of different components of NTFPs to household's annual subsistence and cash incomes by villages (Rs.)

NTFPs income	Mingora	Khwazakhela	Kalam	Overall
Subsistence income				
Firewood	14465	11606	11067	12323
Fodder	6972	8008	4821	6426
Wild vegetables	123	201	40	113
Fruits (walnut only)	257	644	1023	666
Torch wood	524	812	890	749
Agricultural implements	134	147	152	145
Furniture and other household use	255	174	279	241
Thatching material	542	499	227	407
Litter	0	0	468	183
Total	**23272**	**22091**	**18967**	**21253**
Cash income				
Mushrooms	1820	1842	316	1239
Medicinal plants	153	2326	0	712
Fruits (walnuts only)	859	327	2220	1240
Rent from pastures	0	116	415	195
Total	**2832**	**4611**	**2951**	**3386**

Table 4 Average contribution of different components of NTFPs to household's annual subsistence and cash income by wealth quartiles (Rs.)

NTFPs use	Lowest 25%	25%－50%	50%－75%	Top 75%	Overall
Subsistence use					
Firewood	11879	12191	12293	12905	12323
Torchwood	525	1052	791	615	749
Agricultural implements	158	135	145	142	145
Furniture and other minor uses	198	240	245	281	241
Thatcvhing grass	317	408	451	482	407
Litter	152	196	154	229	183
Fodder	5526	5376	7106	7633	6426
Wild vegetables	96	113	122	120	113
Wild fruits (orchards only)	181	258	675	1526	666
Total	**19032**	**19969**	**21982**	**23933**	**21253**
Cash income					
Mushrooms	861	1511	1310	1251	1239
Medicinal plants	2694	118	26	132	712
Rent	108	319	189	160	195
Orchards (walnut only)	580	1417	956	1978	1240
Total	**4243**	**3365**	**2481**	**3521**	**3386**

non-significant in case of cash income and highly significant for subsistence income (Table 5). These findings favour the observation of Adhikhari (2001). Who reported that richer households have more access to the utilization of forest resources including NTFPs compare to the poor members of the society in mountainous areas of Hindu-Kush-Himalaya countries.

3.7 Household size

Household size showed a positive relationship with the NTFPs use for both cash and subsistence income generation. The relationship is non-significant for cash income while highly significant for subsistence income (Table 5). A household with a larger labour force can mobilise household labour in forest extraction activities than households with a smaller labour force. There appears no restriction on the number of people that each household can allocate to harvest forest products. In this scenario, house-

holds with more members tend to collect a larger portion of such products. Furthermore, the educational level of the head of household shows negative non-significant relationship with use of NTFPs for both cash and subsistence income. The total number of educated members in a household also shows non-significant negative relationship with use of NTFPs for cash income generation but shows a positive relationship with NTFPs use for subsistence (Table 5). The present findings agree with the studies of Gunatilake (1998); Adhikhari (2001); Imang *et al.* (2008), they concluded that the educational level of the family is negatively related to forest dependency. However, some of the unemployed educated members of the households and even educated members of family involved in NTFPs collection for subsistence as part of their role in the household.

Land holding and livestock ownership are significantly positively associated with use of NTFPs for both cash and subsistence income (Table 5). This implies that households with a large number of livestock and bigger land holding are more inclined to use NTFPs for both cash and subsistence income. The households with bigger landholdings collect more humus from the forest for manuring agricultural fields and use more wood for making agricultural implements. Moreover, seasonal migration to summer pastures is an important aspect of the households in the study area and shows a significant positive relationship with NTFPs use for both cash and subsistence income (Table 5).

3.8 The safety net role of NTFPs at the household level

A heavy reliance on NTFPs was reported in study area in times of natural catastrophes such as heavy snowfall, drought and floods during summer. Dependence on all NTFPs increases in winter due to heavy snowfall restricting the movement of the household. Some of the households were found selling their share in oak forests for an amount ranging from Rs. 25 000 to Rs. 30 000 to get cash income in case of emergencies like serious illness of family members, to pursue daily activities. The majority of households have limited access to cash income, particularly the villages which are distant from market and not accessible by road. The magnitude of the cash saving may be more important for poorer households due to their low total income. Commercialization of some NTFPs like walnut and morel mushrooms also function as a safety net and livelihood options. Similar results were also reported by Shackeleton and Shackeleton, (2003) and Sher *et al.* (2004b), who identified two levels at which NTFPs provide safety nets for household provisioning. First is the role of NTFPs as an "emergency net" in assisting households

Table 5　Correlation of selected socio-economic characteristics of the respondents against cash and subsistence income from NTFPs

Socio-economic factors	Cash income from NTFPs		Subsistence income from NTFPs	
	R	*P*-value	R	*P*-value
Access to market	−0.080	0.163	−0.310**	0.000
Subsistence income	0.090	0.273	0.112	0.085
Cash income	0.012	0.879	−0.078	0.343
Expenditure	0.008	0.464	0.197**	0.008
Household size	0.144	0.079	0.291**	0.000
Education of Head of HH	−0.139	0.088	−0.102	0.213
Household education	−0.043	0.603	0.029	0.363
Off-farm employment	−0.090	0.271	0.002	0.491
Landholding	0.228**	0.005	0.372**	0.000
Number of livestock	0.225**	0.005	0.349**	0.000
Seasonal migration	0.206*	0.011	0.349**	0.000

(* $P<0.05$, ** $P<0.01$)

in adversity such as shocks and sudden changes in the socio-economic environment. Secondly, the ordinary daily use of NTFPs as a "daily net" allows the direct cost saving amongst rural households.

4 Conclusion

In light of the present study, it can be concluded that (1) NTFPs are the main sources of livelihood capital in the mountainous areas, especially Swat, of northern Pakistan. (2) Over exploitation of these natural forest resources was due to increased demand for these products in the growing national and international markets. (3) Further losses of these natural resources might adversely affect the poor rural communities in there areas through a negative impact on the socio-economic, cultural and environmental conditions.

The study, therefore, recommend the development of these areas can be brought about through sustainable livelihoods approach focusing on all aspects of resource management, which is a complex web of interrelated ecological, socio-economic, cultural and political factors.

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